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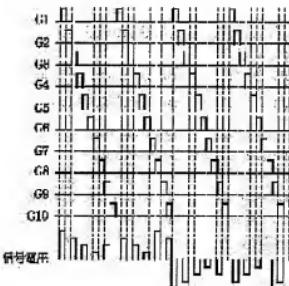
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#### (54) LIQUID CRYSTAL DISPLAY

##### (57)Abstract:

PROBLEM TO BE SOLVED: To improve dynamic image quality in a TV system using a liquid crystal display device.

SOLUTION: In this liquid crystal display constituted of plural pixel electrodes arranged in matrix, switching elements connected to the pixel electrodes and scanning electrodes and signal electrodes connected to the switching elements, the means for inserting a non-display signal into a video signal inputted to the signal electrodes at a prescribed period is provided, and a display is made non-hold.



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#### CLAIMS

##### [Claim(s)]

[Claim 1]A liquid crystal display comprising:

Two or more picture element electrodes arranged at matrix form.

A switching element connected to this picture element electrode.

A means to insert a non-display signal in a video signal inputted into this signal electrode with a

given period in a liquid crystal display which consists of a scanning electrode and a signal electrode which were connected to this switching element.

[Claim 2]The liquid crystal display according to claim 1, wherein said video signal is a video signal of NTSC system or a PAL system.

[Claim 3]The liquid crystal display according to claim 1 or 2, wherein one frame is constituted by the two fields, said scanning electrode is chosen as line sequential in each field and a non-display signal is impressed to a picture element electrode on a scanning electrode of at least an every other in this each field.

[Claim 4]The liquid crystal display according to claim 1, 2, or 3, wherein the polarity of a signal level impressed to said picture element electrode is reversed with a given period.

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#### DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the active matrix type liquid crystal display device used as a display of a television set etc.

[0002]

[Description of the Prior Art]As a conventional liquid crystal display, it is a Twisted Nematic (TN) type display type. The active matrix type liquid crystal display device which has arranged switching elements, such as a thin film transistor (TFT), is generally used for each pixel, and is widely used for it as a display of a television set or a videotape recorder by high contrast as a display in which multi-tone is possible.

[0003]Drawing 4 shows the block diagram of such a conventional liquid crystal display. As the liquid crystal display 1 is shown in drawing 5, it has the indicator 3 by which many picture element electrodes 2 were arranged by matrix form, and the one side terminal of TFT4 is connected to each picture element electrode 2, respectively. The another side terminal which is every TFT4 is connected to the signal electrode 5, respectively, and the gate of TFT4 is connected to the scanning electrode 6, respectively. Each scanning electrode 6 is connected to the scanning circuit 7, respectively, the signal electrode 5 is connected to the data signal circuit 8, and, as for these circuits 7 and 8, the operation is controlled by the control circuit 9.

[0004]The scanning electrode 6 is chosen as line sequential, the signal level corresponding to a desired display is impressed to each signal electrode 5 from the data signal circuit 8 synchronizing with this, and the display of a stroke region ends said scanning circuit 7. Such processing is repeated every [ for example, 1 / 60 seconds or 1 / ] 30 seconds, and the display of a picture is performed.

[0005]When using such a liquid crystal display 1 as what is called a liquid crystal television receiving set, the video signal of NTSC system is used as a signal for a display. In this case, a predetermined video signal is separated in the receiving circuit 11 which a video signal is

received by the antenna 10, for example, includes a detector circuit, an amplifying circuit, etc., After being changed into the digital signal in the analog-to-digital conversion circuit (it abbreviates to an A/D conversion circuit hereafter) 12, Various kinds of signal processing is performed in the digital disposal circuit 13, while being changed into an analog signal in the digital/analog conversion circuit (it abbreviates to a D/A conversion circuit hereafter) 14 and supplying said data signal circuit 8, the reference signal Sy is inputted into the circuits 8 and 9, and a predetermined display action is performed.

[0006]

[Problem(s) to be Solved by the Invention] Drawing 6 is a timing chart which shows a concrete example of operation. The signal level corresponding to the scanning signals G1-G10 and it which are impressed to the scanning electrode 6 of ten duties as an example is shown. Interlace scanning is performed and one frame is constituted from above mentioned NTSC system by the field which scans the odd-numbered scanning electrode, and the field which scans the even-numbered scanning electrode. The polarity reversals of the signal level were usually carried out for every frame, and it has prevented the degradation by canceling the DC component impressed to a liquid crystal layer.

[0007]The method of changing interlace scanning into a non-interlaced scan by image processing for the purpose of flicker prevention of a display is also used. In this case, the signal level of the inverted previous field is impressed to the picture element electrode on a scanning electrode without a video signal corresponding in each field, and the method of complementing image data, etc. are used for it.

[0008]On the other hand, in the field of a display, image quality (quality of an animation) of video came to be made into the problem in recent years. For example, as indicated to "Shingaku Giho" EID96-4 (1996)P.16, It is reported that the continuous light type display (held type display) like the conventional liquid crystal element is theoretically inferior in the quality of an animation compared with a pulse lighting type (impulse type display) like CRT. As corrective strategy of the quality of an animation, the method of controlling a display period at the fixed time in 1 field is proposed by controlling the lighting period of a back light, or ON period of a display device, for example as indicated to JP,09-325715,A. However, such art [-izing / art / un-holding] was not clarified in television systems like [ until now ] NTSC system.

[0009]Therefore, in the television systems which used the liquid crystal display, the purpose of this invention is to improve the quality of an animation by un-holding-izing [ a display ].

[0010]

[Means for Solving the Problem] In a liquid crystal display which consists of a scanning electrode and a signal electrode which were connected to two or more picture element electrodes arranged in this invention at matrix form in order to attain the above-mentioned purpose, a switching element \*\*\*\*(ed) by this picture element electrode, and this switching element, A means to insert a non-display signal in a video signal inputted into this signal electrode with a given period was formed.

[0011]

[Function] According to the above-mentioned composition, a non-display signal is inserted in the video signal inputted into a signal electrode with a given period. Although a selection signal is impressed to a scanning electrode, since the signal impressed to a signal electrode synchronizing with this selection signal is a non-display signal, a non-display state is written in and the hold of a display is forbidden there. That is, a display is forbidden a hold, are-izing [ a display / for every aforementioned given period / un-holding ], and its quality of an animation improves.

[0012]

[The embodiment of operation] Hereafter, an embodiment of the invention is described using a drawing. Drawing 1 is a block diagram showing the composition of the liquid crystal display concerning one embodiment of this invention. Although fundamental composition and function are the same as the conventional example shown in drawing 4, the frame memory 15 is added in this embodiment. The video signal of NTSC system is received by the antenna 10 like the conventional example of drawing 4. After the desired video signal was separated in the receiving circuit 11 and changed into the digital signal in the A/D conversion circuit 12, Various kinds of

signal processing is performed in the digital disposal circuit 13, while being changed into an analog signal in the D/A conversion circuit 14 and supplying said data signal circuit 8, the reference signal Sy is inputted into the circuits 8 and 9, and a predetermined display action is performed. However, the picture image data by which the A/D conversion was carried out is once stored in the frame memory 15. The digital disposal circuit 13 takes out picture image data from the frame memory 15, and in each field, by interface scanning, it performs processing which inserts a non-display signal in each picture image data so that a non-display signal level may be impressed to the picture element electrode on the scanning electrode 6 which is not chosen. While impressing scanning voltage to the scanning electrode 6 in which the control circuit 9 was chosen at this time, operation of impressing selection voltage by line sequential so that the non-display signal described above also to said scanning electrode which is not chosen may be impressed is performed.

[0013] Drawing 2 is a timing chart which shows such an example of operation. The signal level corresponding to the scanning signals G1-G10 and it which are impressed to the scanning electrode 6 of ten duties is shown like drawing 6. In the 1st field, the odd-numbered scanning electrode G1, G3, ..., G9 are chosen, and a corresponding signal level is impressed to the signal electrode 5. It being non-display to the picture element electrode on the scanning electrode G2 which is not chosen in this field, G4, ..., G10 (state the transmissivity of each pixel serving as the minimum substantially), and the non-display signal (in this case, null voltage) for carrying out are impressed to the signal electrode 5. In the 2nd continuing field, the even-numbered scanning electrode is chosen, a signal level is impressed corresponding to this, on the other hand, the scanning electrode whose number is odd is not chosen, but a non-display signal is impressed to a signal electrode corresponding to this, respectively. One frame which displays one screen comprises these 2 fields. However, in this embodiment, since the 1 field is 60 Hz, the selection time per one scanning electrode is 1/2 of the selection time in the conventional example shown in drawing 6. Although operation also with the same following frame is performed, the polarity of a signal level is reversed, the operation which prevents degradation of a liquid crystal layer is made, and it shines.

[0014] Drawing 3 is a timing chart of a scanning signal and a signal level concerning a 2nd embodiment of this invention. The signal system of drawing 3 makes the following field a non-display period, after writing in the 1 field with the signal level of reverse polarity. Thereby, the flicker of an image is improved. By the above operations, in one frame, each pixel is non-display in the field of a displaying condition and another side in one field, and serves as a non-holding display of 50% of a time numerical aperture as a result.

[0015] The liquid crystal used by this invention needs to answer in the 1 field. Therefore, as a liquid crystal to be used, it is a nematic liquid crystal which answers at a ferroelectric liquid crystal, an antiferroelectricity liquid crystal, or a high speed. It can be made to operate similarly to the video signal of a PAL system by performing infanticide operation which is the known art about the difference in the number of scanning lines. That is, in the digital disposal circuit 13, the image of the total range of a status signal can be displayed by thinning out and outputting the video signal stored in the frame memory 15.

[0016]

[Effect of the Invention] As explained above, according to this invention, in a liquid crystal display, the display of the television imagery excellent in the quality of an animation is attained.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]It is a block diagram showing the composition of the liquid crystal display concerning one embodiment of this invention.

[Drawing 2]It is a timing chart for explaining operation of the device of drawing 1.

[Drawing 3]It is a timing chart of a scanning signal and a signal level concerning other embodiments of this invention.

[Drawing 4]It is a block diagram showing the composition of the conventional liquid crystal display.

[Drawing 5]It is a circuit diagram showing the composition of the indicator of the liquid crystal display shown in drawing 4.

[Drawing 6]It is a timing chart for explaining the television systems by the liquid crystal display shown in drawing 4.

[Description of Notations]

A:liquid crystal display, 2:picture element electrode, 3:indicator, 4:TFT, 5 : 1: A signal electrode, 6: A scanning electrode, 7:scanning circuit, 8:data signal circuit, 9:control circuit, 10:antenna, 11:receiving circuit, 12:analog-to-digital conversion circuit, 13:digital disposal circuit, 14:digital/analog conversion circuit, 15 : frame memory.

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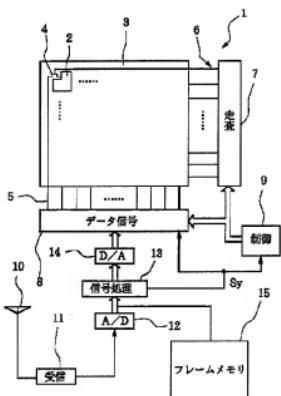
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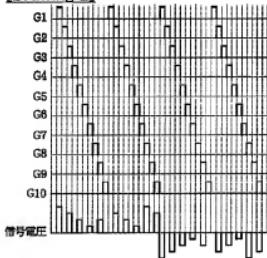
## DRAWINGS

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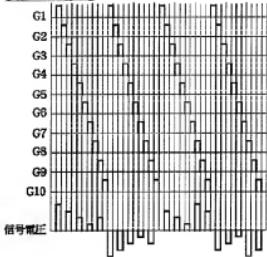
[Drawing 1]



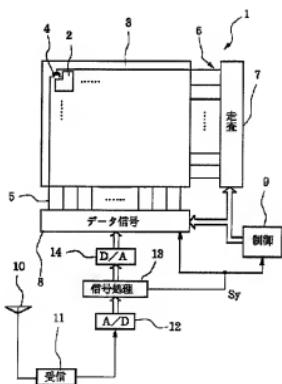
[Drawing 2]



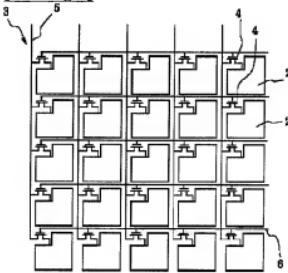
[Drawing 3]



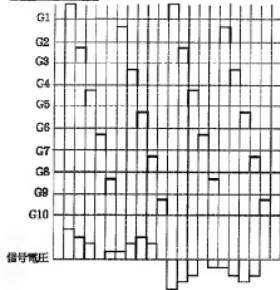
[Drawing 4]



[Drawing 5]



[Drawing 6]




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